REMARKS

Claims 14-36 are pending in this application. Claims 14, 15, 17-24, 32, 33, and 35 are allowed. Claims 16, 25-27, 29, 34, and 36 are rejected. Claims 28, 30, and 31 are objected to.

Applicants acknowledge with appreciation the Examiner's allowance of Claims 14, 15, 17-24, 32, 33, and 35.

Claims 34 and 36 are rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as their invention. Claims 34 and 36 have been amended to remove the phrase "of the type". Applicants submit that Claims 34 and 36 as currently amended are believed to meet the requirements for patentability and request that the rejection of Claims 34 and 36 under 35 USC 112, second paragraph, be withdrawn.

Claim 35 has also been amended to remove the phrase "of the type".

Claims 16, 25-27, and 29 are rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 6,023,037 to Church et al.

In regards to Claim 16, the Examiner stated that Church et al. disclose an electronic ballast including a valley-fill circuit including a bus capacitor, the ballast having integral over-voltage protection for the bus capacitor, the ballast comprising: a rectifier, an inverter, and said valley-fill circuit connected between the rectifier and the inverter, the valley-fill circuit including a buck converter connected between an output of the rectifier and an input of the inverter. The Examiner noted that Church et al. fail to explicitly disclose that the load is a discharge lamp. The Examiner continued by stating that since the discharge lamp is in the preamble of Claim 16, the discharge lamp is not accorded any patentable weight where the preamble merely recites the purpose of the intended use of the a structure and where the body of the claim does not depend on the preamble for completeness.

Claim 16 has been amended to include the limitation of an inverter "for producing a high-frequency alternating current (AC) voltage for driving the gas discharge lamp." The

Applicants note that since the gas discharge lamp is now recited in the body of the claim, the body of the claim now depends on the gas discharge lamp in the preamble for completeness.

The Applicants submit that Church et al. disclose an arc welder with a DC-DC converter 40 connected between the buck converter 20 and the load. In column 6, at lines 61-62, Church et al. state that the DC-DC converter 40 reduces the intermediate voltage across leads 42, 44 to a DC welding voltage. Claim 16 of the current invention now recites that the inverter produces a high-frequency AC voltage. Applicants submit that Church et al. neither teach nor disclose using an inverter for producing a high-frequency AC voltage to drive a gas discharge lamp.

The Applicants submit that a person of ordinary skill in the art would not look to the arc welder of Church et al. for the design of a ballast to be used to drive a gas discharge lamp. The module of Church et al. is intended to have a smooth DC output voltage below 113 volts (column 3, lines 65-67). The Applicants note that a gas discharge lamp is most preferably driven by a high-frequency AC voltage. The Applicants submit a person of ordinary skill in the art knows that a gas discharge lamp driven by a DC voltage will result in mercury pumping, i.e., mercury in the gas discharge lamp migrating to one end of the lamp resulting in non-uniform light output and poor operation. This is clearly not a problem that one of skill in the art of arc welding would be confronted with.

The Examiner stated that Church et al. disclose an electronic ballast having a valley-fill circuit connected between the rectifier and the inverter, the valley-fill circuit including a buck converter connected between an output of the rectifier and an input of the inverter. The Applicants submit that Church et al. disclose using a buck converter as the power factor correcting circuit, rather than using a valley-fill circuit (column 3, lines 29-36). The Applicants note that Church et al. distinguish between using a passive circuit, such as a valley-fill circuit, and an active circuit, such as a buck converter, for the power factor correcting circuit. The Applicants submit that Church et al. teach away from using a valley-fill circuit by stating that a valley-fill circuit can only be used for extremely small welders, and hence a valley-fill power factor correcting circuit could not be used for a wide range of welders and cutters, which is a basic objective of Church et al. (column 2, line 59 through column 3, line 14).

The Applicants submit that a buck converter is not the same as a valley-fill circuit including a buck converter. The Applicants submit that Church et al. disclose using only a buck converter connected between the output of the rectifier and the input of the DC-DC converter (column 6, lines 49-53). The Applicants note that the buck converter of Church et al. produces a smooth, constant DC voltage as shown by waveform V_D in Figure 3 of Church et al. In contrast, the Applicants note that the valley-fill circuit of the current invention, which includes a buck converter, produces a pulsating DC voltage as shown by the waveform labeled BUS VOLTAGE in Figure 7 of the current invention.

The Applicants note that the buck converter of Church et al. and the valley-fill circuit of the current invention perform different functions. In the valley-fill circuit 830 of the current invention, the bus capacitor 916 supplies current to the inverter 860 only during the "valleys" of the rectified voltage, i.e., when the bus capacitor voltage is greater than the rectified voltage (Fig. 7 of the current invention). During the "valleys", the diode 840 is reverse biased and the diode 918 is forward biased into conduction. This establishes a discharge path for the bus capacitor 916 from circuit common 930, through the diode 918 and the bus capacitor 916, to the buck converter output 928 (page 8, line 28 through page 9, line 10 of the current invention). When the bus capacitor voltage is less than the rectified voltage, diode 840 is forward biased and the inverter 860 draws current from the rectifier 820, not from the bus capacitor 916.

In contrast, the DC-DC converter 40 of Church et al. draws current from the output storage capacitor 30 of the buck converter 20 throughout the line cycle. The Applicants submit that the difference in operation of the buck converter of Church et al. and the valley-fill circuit of the current invention reinforces the fact that Church et al. do not disclose an electronic ballast including a valley-fill circuit having a buck converter.

Applicants submit that Claim 16 meets the requirements for patentability and request that the rejection of Claim 16 under 35 USC 103(a) be withdrawn.

In regards to Claim 25, the Examiner stated that Church et al. disclose an electronic ballast comprising a rectifier for receiving a sinusoidal AC power and producing a rectified DC bus voltage; a valley-fill circuit for receiving the rectified DC bus voltage and

maintaining the bus voltage above a predetermined minimum voltage; an inverter for receiving the bus voltage and producing a high-frequency AC voltage for driving the load; and a control circuit for producing control signals to control the operation of the inverter; said valley-fill circuit including an energy storage element, an impedance, and a switch; said energy storage element adapted to be connected between the bus voltage and a circuit common by means of the impedance when the switch is in a first predetermined conductive state so as to store energy.

The Examiner noted that Church et al. fail to explicitly disclose that the load is a discharge lamp. The Examiner continued by stating that since the discharge lamp is in the preamble of Claim 25, the discharge lamp is not accorded any patentable weight where the preamble merely recites the purpose of the intended use of the a structure and where the body of the claims does not depend on the preamble for completeness. The Applicants draw the Examiner's attention to the recitation of the gas discharge lamp in the body of the claim, noting that since the gas discharge lamp is recited in the body of the claim, the body of the claim depends on the gas discharge lamp for completeness.

Furthermore, the Examiner stated that Church et al. disclose an electronic ballast comprising an inverter for producing a high-frequency AC voltage for driving the load. The Applicants submit that Church et al. disclose an arc welder with a DC-DC converter (40) connected between the buck converter (20) and the load. In column 6, at lines 61-62, Church et al. state that the DC-DC converter (40) reduces the intermediate voltage across leads 42, 44 to a DC welding voltage. The Applicants note that Claim 25 of the current invention recites that the inverter produces a high-frequency AC voltage for driving the gas discharge lamp. Applicants submit that Church et al. neither teach nor disclose using an inverter for producing a high-frequency AC voltage for driving a gas discharge lamp.

The Applicants submit that a person of ordinary skill in the art would not look to the arc welder of Church et al. for the design of a ballast to be used to drive a gas discharge lamp. The module of Church et al. is intended to have a smooth DC output voltage below 113 volts (column 3, lines 65-67). The Applicants note that a gas discharge lamp is most preferably driven by a high-frequency AC voltage. The Applicants submit a person of ordinary skill in the art knows that a gas discharge lamp driven by a DC voltage will result in mercury pumping, i.e.,

mercury in the gas discharge lamp migrating to one end of the lamp resulting in non-uniform light output and poor operation. This is clearly not a problem that one of skill in the art of arc welding would be confronted with.

The Examiner stated that Church et al. disclose an electronic ballast having a valley-fill circuit. The Applicants submit that Church et al. disclose using a buck converter as the power factor correcting circuit, rather than using a valley-fill circuit (column 3, lines 29-36). The Applicants note that Church et al. distinguish between using a passive circuit, such as a valley-fill circuit, and an active circuit, such as a buck converter, for the power factor correcting circuit. The Applicants submit that Church et al. teach away from using a valley-fill circuit by stating that a valley-fill circuit can only be used for extremely small welders, and hence a valley-fill power factor correcting circuit could not be used for a wide range of welders and cutters, which is a basic objective of Church et al. (column 2, line 59 through column 3, line 14).

The Examiner stated that Church et al. disclose an electronic ballast having a valley-fill circuit for receiving the rectified DC bus voltage (from the rectifier) and maintaining the bus voltage above a predetermined minimum voltage. The Applicants submit that Church et al. disclose using only a buck converter connected between the output of the rectifier and the input of the DC-DC converter (column 6, lines 49-53). The Applicants submit that a buck converter is not the same as a valley-fill circuit including a buck converter. The Applicants note that the buck converter of Church et al. produces a smooth, constant DC voltage as shown by waveform V_D in Figure 3 of Church et al. The Applicants note that the valley-fill circuit of the current invention, which includes a buck converter, produces a pulsating DC voltage as shown by the waveform labeled BUS VOLTAGE in Figure 7 of the current invention.

Moreover, the Applicants note that the buck converter of Church et al. and the valley-fill circuit of the current invention perform different functions. In the valley-fill circuit 830 of the current invention, the bus capacitor 916 supplies current to the inverter 860 only during the "valleys" of the rectified voltage, i.e., when the bus capacitor voltage is greater than the rectified voltage (Fig. 7 of the current invention). During the "valleys", the diode 840 is reverse biased and the diode 918 is forward biased into conduction. This establishes a discharge path for the bus capacitor 916 from circuit common 930, through the diode 918 and the bus

capacitor 916, to the buck converter output 928 (page 8, line 28 through page 9, line 10 of the current invention). When the bus capacitor voltage is less than the rectified voltage, diode 840 is forward biased and the inverter 860 draws current from the rectifier 820, not from the bus capacitor 916.

In contrast, the DC-DC converter 40 of Church et al. draws current from the output storage capacitor 30 of the buck converter 20 throughout the line cycle. The Applicants submit that the difference in operation of the buck converter of Church et al. and the valley-fill circuit of the current invention reinforces the fact that Church et al. do not disclose an electronic ballast including a valley-fill circuit having an energy storage element adapted to be connected between a bus voltage and a circuit common through an impedance by means of a switch.

Applicants submit that Claim 25 meets the requirements for patentability and request that the rejection of Claim 25 under 35 USC 103(a) be withdrawn.

Regarding Claim 26, the Examiner stated that Church et al. disclose that the energy storage element comprises a capacitor. Because Claim 26 is dependent on Claim 25, Applicants submit that Claim 26 meets the requirements for patentability as noted above and request that the rejection of Claim 26 under 35 USC 103(a) be withdrawn.

Regarding Claim 27, the Examiner stated that Church et al. disclose that the impedance comprises an inductor. Because Claim 27 is dependent on Claim 25, Applicants submit that Claim 27 meets the requirements for patentability as noted above and request that the rejection of Claim 27 under 35 USC 103(a) be withdrawn.

Regarding Claim 29, the Examiner stated that Church et al. disclose that the switch comprises a field-effect transistor. Because Claim 29 is dependent on Claim 25, Applicants submit that Claim 29 meets the requirements for patentability as noted above and request that the rejection of Claim 29 under 35 USC 103(a) be withdrawn.

Applicants submit that in view of the facts and reasons set forth above, this application is believed to be in condition for allowance, and request early notification to this effect.

Respectfully Submitted,

LUTRON ELECTRONICS COMPANY

By Mark E. Rose
Mark E. Rose
Reg. No. 42,113

LUTRON ELECTRONICS CO., INC.
7200 Suter Road
Coopersburg, PA 18036
(610) 282-3800

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